

WHAT IS CLAIMED IS:

1           1. A data transmission circuit having a first  
2 transmission mode and a second transmission mode  
3 transmitting data at a lower speed than the first  
4 transmission mode, the data transmission circuit  
5 outputting output data to a data output line in accordance  
6 with input data, comprising:  
7           a constant current driver having a constant current  
8 source and circuitry connected to the data output line;  
9           a buffer circuitry connected to the data output line,  
10 having a plurality of switching elements and controlling  
11 impedance by the switching elements;  
12           a dummy buffer having a plurality of corresponding  
13 switching elements, each of the corresponding switching  
14 elements corresponding to each of the switching elements  
15 of the buffer and having substantially the same capacitance  
16 as each of the switching elements of the buffer; and  
17           a selection circuit selecting between the switching  
18 elements of the buffer and between the corresponding  
19 switching elements of the dummy buffer in accordance with  
20 an impedance control signal, the selection circuit not  
21 selecting corresponding switching elements of the dummy  
22 buffer corresponding to selected switching elements of the  
23 buffer, while selecting corresponding switching elements  
24 of the dummy buffer corresponding to non-selected switching  
25 elements of the buffer;  
26           wherein, in the first transmission mode, the selected  
27 switching elements of the buffer selected by the selection

28 circuit are set to on or off state, and the constant current  
29 driver operates in accordance with the input data to output  
30 data, and

31 in the second transmission mode, the selected  
32 switching elements of the buffer selected by the selection  
33 circuit are on/off controlled in accordance with the input  
34 data to output data.

1 2. A data transmission circuit according to Claim  
2 1, further comprising a prebuffer outputting a signal to  
3 the buffer in accordance with input data.

1 3. A data transmission circuit according to Claim  
2 1, further comprising a feedback capacitor adjusting a slew  
3 rate of data output.

1 4. A data transmission circuit according to Claim  
2 2, further comprising an output load capacitor of the  
3 prebuffer to adjust a slew rate of data output.

1 5. A data transmission circuit according to Claim  
2 1, further comprising:

3 another buffer circuitry connected to the data output  
4 line, having a plurality of switching elements and  
5 controlling impedance by the switching elements;

6 another dummy buffer having a plurality of  
7 corresponding switching elements, each of the  
8 corresponding switching elements corresponding to each of  
9 the switching elements of the another buffer and having

10 substantially the same capacitance as each of the switching  
11 elements of the another buffer; and

12 another selection circuit selecting between the  
13 switching elements of the another buffer and between the  
14 corresponding switching elements of the another dummy  
15 buffer in accordance with an impedance control signal, the  
16 another selection circuit not selecting corresponding  
17 switching elements of the another dummy buffer  
18 corresponding to selected switching elements of the another  
19 buffer, while selecting corresponding switching elements  
20 of the another dummy buffer corresponding to non-selected  
21 switching elements of the another buffer;

22 wherein, the input data and the output data have a  
23 first logic condition and a second logic condition, and  
24 in the second transmission mode, the selected  
25 switching elements of the buffer are on/off controlled in  
26 accordance with the input data to output data in the first  
27 logic condition, and the selected switching elements of  
28 the another buffer are on/off controlled in accordance with  
29 the input data to output data in the second logic condition.

1 6. A data transmission circuit according to Claim  
2 5, wherein, in the first transmission mode, the another  
3 buffer is isolated from the data output line.

1 7. A data transmission circuit having a first  
2 transmission mode and a second transmission mode, the data  
3 transmission circuit outputting output data to a data  
4 output line in accordance with input data, comprising:

5           a constant current driver having a constant current  
6   source and circuitry connected to the data output line;  
7   and

8           an impedance control circuit circuitry connected to  
9   the data output line, having a plurality of switching  
10   elements, and controlling impedance by selectively turning  
11   on the switching elements,

12          wherein, in the first transmission mode, the output  
13   data is output in accordance with an output from the constant  
14   current driver operating based on the input data and  
15   impedance of the impedance control circuit, and

16          in the second transmission mode, the output data is  
17   output by turning on/off selected switching elements of  
18   the impedance control circuit in accordance with the input  
19   data.

1           8. A data transmission circuit according to Claim  
2   7, wherein the switching elements of the impedance control  
3   circuit are selected in such a way that output impedance  
4   of the data transmission circuit is substantially a given  
5   value.

1           9. A data transmission circuit according to Claim  
2   7, wherein, in the first transmission mode, the switching  
3   elements of the impedance control circuit are selected in  
4   such a way that an output level of the output data is  
5   substantially a given value.

1           10. A data transmission circuit according to Claim

2 7, further comprising a resistive element between the  
3 constant current driver and the impedance control circuit.

1 11. A data transmission circuit according to Claim  
2 7, further comprising a capacitor adjustment circuit  
3 adjusting a capacitor connected to the data output line  
4 by selectively connecting a plurality of elements to the  
5 data output line, the capacitor adjustment circuit  
6 controlled to compensate a capacitance change in the  
7 selected switching elements.

1 12. A data transmission circuit according to Claim  
2 11, wherein  
3 the plurality of elements of the capacitor adjustment  
4 circuit are corresponding switching elements, each of which  
5 corresponding to each of the plurality of switching  
6 elements and having substantially the same capacitance as  
7 each of the switching elements, and  
8 corresponding switching elements corresponding to  
9 selected switching elements are isolated from the data  
10 output line, while corresponding switching elements  
11 corresponding to non-selected switching elements are  
12 connected to the data output line.

1 13. A data transmission circuit according to Claim  
2 1, further comprising another impedance control circuit  
3 connected to the data output line, having a plurality of  
4 switching elements, and controlling impedance by  
5 selectively setting the switching elements to on state,

6            wherein, in the second transmission mode, a selected  
7   one of the impedance control circuit and the another  
8   impedance control circuit outputs data to the data output  
9   line in accordance with a logic level of the input data.

1           14. A data transmission circuit according to Claim  
2   13, wherein, in the first transmission mode, the another  
3   impedance control circuit is separated from the data output  
4   line.

1           15. A data transmission circuit according to Claim  
2   7, further comprising a prebuffer outputting a signal to  
3   the impedance control circuit in accordance with input  
4   data.

1           16. A data transmission circuit according to Claim  
2   7, wherein a transmission speed of the first transmission  
3   mode is faster than that of the second transmission mode.

1           17. A data transmission circuit having a first  
2   transmission mode and a second transmission mode, the data  
3   transmission circuit outputting output data to a data  
4   output line in response to input data, comprising:

5           a constant current driver outputting the data in the  
6   first transmission mode, said constant current driver  
7   having a constant current source and circuitry connected  
8   to the data output line to output the data in response to  
9   the input data;

10           a constant voltage driver outputting the data in the

11 second transmission mode, said constant voltage driver  
12 having a plurality of switching elements connected to the  
13 data output line to output the data in response to the input  
14 data;

15 a selection circuit selectively activate the  
16 plurality of switching elements to change an output  
17 impedance of the constant voltage driver.

1 18. A data transmission circuit according to Claim  
2 17, wherein said selection circuit turns on at least one  
3 of said plurality of switching elements in said first  
4 transmission mode, said at least one of said plurality  
5 of switching elements operate as an terminating resistance.

1 19. A data transmission method having a first  
2 transmission mode and a second transmission mode, the data  
3 transmission method outputting output data in accordance  
4 with input data, comprising:

5 in the first transmission mode,

6 a step of selectively setting a plurality of switching  
7 elements to on state in accordance with an impedance control  
8 signal;

9 a step of controlling a constant current driver based  
10 on the input data; and

11 a step of outputting output data in accordance with  
12 an output of the constant current driver and on-state  
13 resistance of the switching elements; and,

14 in the second transmission mode,

15 a step of selecting selected switching elements from

16 the plurality of switching elements in accordance with an  
17 impedance control signal; and  
18 a step of outputting data by turning on/off the  
19 selected switching elements in accordance with the input  
20 data.

1 20. A data transmission method according to Claim  
2 19, further comprising a step of adjusting a slew rate of  
3 data output by selecting switching elements corresponding  
4 to non-selected switching elements of the plurality of  
5 switching elements and having substantially the same  
6 capacitance.